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(54) METHOD OF PRODUCING A PAPER HAVING A THREE-DIMENSIONAL PATTERN

VERFAHREN ZUR HERSTELLUNG VON PAPIER MIT EINEM DREIDIMENSIONALEN MUSTER

PROCEDE DE PRODUCTION DE PAPIER AYANT UN MODELE TRIDIMENSIONNEL

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(56) References cited:
EP-A1- 0 490 655

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Description

Technical field

[0001] The present invention refers to a method of producing a paper having a three dimensional pattern of alternating raised and recessed portions, which has been provided in connection with impulse drying, at which the wet paper web is passed through at least one press nip comprising a rotatable roll which is heated and that the paper web during the passage through the press nip is given a three dimensional pattern of alternating raised and recessed portions either by means of a patterned wire, band or belt and/or by a pattern on the heated roll and where said pattern is pressed into the paper web against a counter means.

Background of the invention

[0002] Moist paper webs are usually dried against one or more heated rolls. A method which is commonly used for tissue paper is so called Yankee drying. At Yankee drying the moist paper web is pressed against a steam-heated Yankee cylinder, which can have a very large diameter. Further heat for drying is supplied by blowing of heated air. If the paper to be produced is soft paper the paper web is usually creped against the Yankee cylinder. The drying against the Yankee cylinder is preceded by a vacuum dewatering and a wet pressing, in which the water is mechanically pressed out of the paper web.

[0003] Another drying method is so called through-air-drying (TAD). In this method the paper is dried by means of hot air which is blown through the moist paper web, often without a preceding wet pressing. The paper web which enters the through-air-dryer is then only vacuum dewatered and has a dry content of about 25-30% and is dried in the through-air-dryer to a dry content of about 65-95%. The paper web is transferred to a special drying fabric and is passed over a so called TAD cylinder having an open structure. Hot air is blown through the paper web during its passage over the TAD cylinder. Paper produced in this way, mainly soft paper, becomes very soft and bulky. The method however is very energy-consuming since all water that is removed has to be evaporated. In connection with the TAD drying the pattern structure of the drying fabric is transferred to the paper web. This structure is essentially maintained also in wet condition of the paper, since it has been imparted to the wet paper web. A description of the TAD technique can be found in e g US-A-3,301,746.

[0004] Impulse drying of a paper web is disclosed in e g SE-B-423 118 and shortly involves that the moist paper web is passed through the press nip between a press roll and a heated roll, which is heated to such a high temperature that a quick and strong steam generation occurs in the interface between the moist paper web and the heated roll. The heating of the roll is e g accomplished by gas burners or other heating devices, e g by means of electromagnetic induction. By the fact that the heat transfer to the paper mainly occurs in a press nip an extraordinarily high heat transfer speed is obtained. All water that is removed from the paper web during the impulse drying is not evaporated, but the steam on its way through the paper web carries along water from the pores between the fibers in the paper web. The drying efficiency becomes by this very high.

[0005] In EP-A- 0 490 655 there is disclosed the production of a paper web, especially soft paper, where the paper simultaneously with impulse drying is given an embossed surface.This embossment is made by pressing a pattern into the paper from one or both sides against a hard holder-on. This gives a compression of the paper and by this a higher density in certain portions just opposite the impressions and a lower density in the intermediate portions.

[0006] In DE-A-26 15 889 there is disclosed a thermobonded embossed soft paper. Thermoplastic fibers are added to the paper web and after drying thereof the paper web is heated to a temperature exceeding the softening temperature of the thermoplastic fibers. Simultaneously with this heating the paper is pattern embossed. Through-air-drying is mentioned as a drying method.

The object and most important features of the invention

[0007] The object of the present invention is to provide a method of producing an impulse dried paper having a three-dimensional pattern, e g a soft paper intended as toilet paper, kitchen rolls, paper handkerchiefs, table napkins and the like, and where the paper has a high bulk, high elasticity and a high softness. It is a further object that the method should give a great possibility of choosing the composition and complexity of the pattern. The paper structure should essentially be maintained also in wet condition. This has according to the invention been provided by the fact that the wet paper web is passed through at least one further press nip comprising a rotatable heated roll and that the paper web also during the passage through said further press nip in connection with impulse drying is given a three dimensional pattern of alternating raised and recessed portions.

[0008] It is by this possible to provide a combination of patterning effects which cannot be provided in one single press nip, said patterns can on one hand give the paper an attractive structure and o the other hand provide advantegeous functional qualities such as strength, draping qualities and absorption capacity.

[0009] Further features and advantages of the invention are disclosed in the following description and in the dependant claims.

Description of the drawings

[0010] The invention will in the following be closer described with reference to some embodiments shown in the accompanying drawings.

Fig. 1-3 are schematic side views of an impulse drying device according to some different embodiments.

Description of the invention

[0011] Fig. 1 shows schematically a device for performing impulse drying of a paper web. The wet paper web 10 which is dewatered over suction boxes (not shown) is supported by a wire or felt 11 and is brought into a press nip 12a between two rotatable rolls 13a and 14a, at which the roll 13 which is in contact with the paper web is by a heating device 15 heated to a temperature which is sufficiently high for providing drying of the paper web. The surface temperature of the heated roll can vary depending on such factors as the moisture content of the paper web, thickness of the paper web, the contact time between the paper web and the roll and the desired moisture content of the completed paper web. The surface temperature should of course not be so high the paper web is damaged. An appropriate temperature should be in the interval 100-400°C, preferably 150-350°C and most preferably 200-350°C.

[0012] The paper web is pressed against the heated roll 13 by means of the roll 14. The press device may of course be designed in many other ways. Two and more press devices may also be arranged after each other. The holder-on 14 may also be a press shoe. In the case the paper web 10 is supported by a wire 11 there could be arranged a felt under the wire, said felt extending around the holder-on roll 14. The function of the felt is to improve the dewatering effect and extend the press nip. It is also possible that the paper web 11 is passed into the press nip unsupported, i e not supported by any wire or felt.

[0013] A very rapid, violent and almost explosive steam generation takes place in the interface between the heated roll 13 and the moist paper web, at which the generated steam on its way through the paper web carrics away water. For a further description of the impulse drying technique reference is made to the above mentioned SE-B-423 118 sand e g to EP-A- 0 337 973 sand US-A-5,556,511.

[0014] The paper web is then transferred to a new wire or felt 16 and into a second press nip 12b between two rotatable rolls 13b and 14b, at which the roll 13b which is in contact with the paper web 10 is by means of a heating device 15b heated to a temperature which is sufficiently high to provide a second impulse drying of the paper web. This of course implies that the paper web before the second press nip is not completely dry but has a dry content of at least 10 and preferably at least 20 weight-%. This can be achieved if the drying in the first impulse drying step in the press nip 12a is not complete and/or that a moistening of the paper web 10 takes place before the second impulse drying step in the press nip 12b by means of a moistening device 18.

[0015] According to the embodiment shown the patterns are pressed into the paper web from different directions. it is of course also possible to press the different patterns into the paper web from the same direction.

[0016] The paper is after drying wound on a wind-up roll 16. If desired the paper can be creped before winding. It is however noted that the need for creping the paper in order to impart softness and bulk which is aimed at for soft paper, is reduced when using the impulse drying method according to the invention, since the paper by the three-dimensional structure and the chosen pattern is imparted bulk and softness.

[0017] The paper web can before it is brought into the impulse dryer either can be only dewatered over suction boxes or besides slightly pressed according to a conventional process.

[0018] Simultaneously with the impulse drying the paper is given a three-dimensional structure. This can be made as shown in Fig. 1 by the fact that the heated rolls 13a and b are provided with an embossing pattern consisting of alternating raised and recessed areas. This structure is substantially maintained also in a later wetted condition of the paper, since it has been imparted the wet paper web in connection with drying thereof. Since the term embossing is normally used for a shaping performed on dried paper we have in the following used the term press moulding for the three-dimensional shaping of the paper that occurs simultaneously with the impulse drying. By this press moulding the bulk and absorption capacity of the paper is increased, which are important qualities for soft paper.

[0019] The paper can be pressed against a non-rigid surface, i e a compressible press felt 11. The rolls 14a, b can also have an elastically yielding surface, e g an envelope surface of rubber. The paper is herewith given a three-dimensional structure the total thickness of which is greater than the thickness of the unpressed paper. By this the paper is imparted a high bulk and by that a high absorption capacity and a high softness. Besides the paper will be elastic. At the same time a locally varying density is obtained in the paper.

[0020] The paper can also be pressed against a hard surface, e g a wire 11 and/or a roll 14 having a hard surface, at which the pattern of the heated roll 13 is pressed into the paper web under a heavy compression of the paper opposite the impressions, while the portions therebetween are kept uncompressed.

[0021] The patterns that are given the paper web in the two impulse drying steps are preferably different. One pattern may for example have a distinguishably greater dimension as compared to the second pattern. The different patterns may also have a determined but different periodicity, at which the difference in periodicity between the two patterns is considerably smaller than the periodicity of any of the patterns, at which a Moirae effect is obtained in the paper.

[0022] According to t further embodiment the first pattern has such a structure that it forms continuous zones in the paper in a certain direction, while the second pattern forms continuous zones in another direction of the

paper. If these zones are compacted areas in the paper there is obtained a strength improvement in the paper in both pattern directions.

[0023] According to the embodiment shown in Fig. 2 the three-dimensional pattern in the paper web is produced by a pattern band or belt 11', which extends around and is heated by the cylinder 13a. The pattern of the band 11' is press moulded into the paper web as this passes through the press nip 12a between the rolls 13 and 14a. The paper web 10 is supported by a felt 17 through the press nip.

[0024] Alternatively the wire 11, which during drying supports the paper web 10, could have a pattern, which during the impulse drying is press moulded into the paper web. The roll 13a can either be smooth, as is shown in Fig. 2, or have an embossing pattern. In the case the roll 13a is smooth the press moulded paper will have one smooth surface and one surface with indentations. In the case the roll 13a has an embossing pattern this will also be pressed into the paper, which thus on one side will have a pattern corresponding to the structure of the wire 11 and on the opposite side having a pattern corresponding to the embossing pattern of the roll. The pattern may but need not coincide and/or be the same or different.

[0025] According to the embodiment of Fig. 3 the two impulse drying cylinders 13a and b may have a common holder-on cylinder 14. The patterns from the two cylinders 13a,b will then be pressed into the paper web 10 from the same direction, said paper web being supported by a felt or wire 11 through the two press nips 12a and b.

[0026] According to one embodiment of the invention the paper web has a varying material composition as seen in its thickness direction, in such a way that it at least in the layer(s) that will be located closest to heated roll 13 in connection with the impulse drying contains a certain amount of a material which softens, melts or hardens in the temperature interval 100-400°C. By this the paper will get a surface layer which contributes in reinforcing the structural stability of the paper also in wet condition. The pulp composition in the rest of the paper layers can on the other hand be chosen for optimizing other properties such as softness, strength, bulk and draping qualities.

[0027] Said material which in connection with impulse drying softens, melts or hardens can consist of a wet strength agent, synthetic or natural polymers with thermoplastic properties, chemically modified lignin and/or synthetic or natural polymers in the presence of softening agents or of a lignin-containing high yield pulp.

[0028] The wet strength agent, which hardens at high temperatures, can consist of a polyamide amine epichlorhydrine resin, polyacryl amide resin, acrylic emulsion, ureaformaldehyde resin, polythene imine resin, a modified starch and/or a modified cellulose derivative. The content of wet strength agent in the layer which is intended to be located closest to the heated roll 13 should be at least 0.05 weight% calculated on the dry fiber weight.

[0029] Examples of materials that softens or melts in the temperature interval 100-400°C are synthetic or natural polymers with thermoplastic properties, chemically modified lignin and/or synthetic or natural polymers in the presence of softening agents. The material can either be in the form of powder, flakes, fibers or an aqueous suspension, e g a latex dispersion. Examples of thermoplastic polymers are polyolefines such as polyethylene and polypropylene, polyesters etc.

[0030] By adding to the paper web said material, which is brought to soften or melt, there is achieved an increased amount of bonding sites in the paper web. By this the basis weight variation and three-dimensional structure, that has been imparted to the paper web in connection with the combined impulse drying and press moulding, is effectively permanented. This three-dimensional structure is maintained also in the wet condition of the paper.

[0031] According to the invention drying, thermobonding and pattern embossing takes place in one and the same step - the impulse drying step - at which there is achieved a more stable paper structure with a low degree of inner stresses, which otherwise will easily occur if the paper is dried and the fibrous structure by this is locked before the thermobonding.

[0032] As mentioned above the softening or melting material according to the invention may also consist of a lignin containing high yield pulp, which will be described more in detail below.

[0033] Paper can be produced by a number of different pulp types. If one disregards recovery pulp, which today is used to a great extent mainly for toilet paper and kitchen rolls, the most commonly used pulp type for soft paper is chemical pulp. The lignin content in such pulp is practically zero and the fibers, which mainly consist of pure cellulose, are relatively thin and flexible. Chemical pulp is a low yield pulp since it gives a yield of only about 50% calculated on the wooden raw material used. It is therefore a relatively expensive pulp.

[0034] It is therefore common to use cheaper so called high yield pulps, e g mechanical, thermomechanical pulp, chemomechanical pulp (CMP) or chemothermomechanical pulp (CTMP) in soft paper as well as in other types of paper, e g newsprint paper, cardboard etc. In high yield pulps the fibers are coarser and contain a high amount of lignin, resins and hemicellulose. The lignin and the resins gives the fibers more hydrophobic properties and a reduced ability ro form hydrogen bonds. The addition of a certain amount of chemothermomechanical pulp in soft paper has due to the reduced fiber-fiber bonding a positive effect on properties like bulk and absorption capacity.

[0035] A special variant of chemothermomechanical pulp (CTMP) is so called high temperature chemothermomechanical pulp (HT-CTMP), the production of which differs from the production of CTMP of conven-

tional type mainly by using a higher temperature for impregnation, preheating and refining, preferably no lower than 140°C. For a more detailed description of the production method for HT-CTMP reference is made to WO 95/34711. Characterizing for HT-CTMP is that it is a long fibrous-, easily dewatered- and bulky high yield pulp with a low shives content and low fines content.

[0036] It has according to the invention been found that high yield pulp is especially suitable for impulse drying since it is pressure insensitive, easily dewatered and has an open structure which admits the generated steam to pass through. This minimizes the risk for the paper to be overheated and destroyed during the impulse drying, which is performed at considerably higher temperatures than in other drying methods. The pressure insensitivity and the open structure depends on that the fibers in high yield pulp are relatively coarse and stiff as compared to the fibers in chemical pulp.

[0037] Impulse drying takes place at a considerably higher temperature than e g Yankee drying or through-air-drying, at which according to a theory, to which however the invention is not bound, the softening temperature of the lignin present in the high yield pulp is reached during the simultaneous impulse drying and press moulding. When the paper becomes cooler the lignin stiffens again and contributes in permanenting the three-dimensional structure that has been given the paper. This is therefore essentially maintained also in the wet condition of the paper, which strongly improves the bulk and absorption qualities of the paper.

[0038] According to one embodiment of the invention the paper contains, at least in the layer(s) which is/are located closest to the heated rolls 13a,b during the impulse drying, a certain amount of a high yield pulp, said amount should be at least 10 weight% calculated on the dry fiber weight, preferably at least 30 weight% and more preferably at least 50 weight%. Other layers may contain any optional pulp or combination of different types of pulp in order to give desired qualities such as softness, strength, bulk etc. So does for example chemical pulp, preferably long-fibrous kraft pulp, provide a high strength of the paper. Recycled pulp may of course also be contained in the paper.

[0039] The paper web is in this case formed in at least two separate layers, either by means of a multilayer headbox or by two or more consecutive headboxes, at which the pulp composition in at least two layers are different.

[0040] It is of course also possible to combine different types of the above stated materials such as lignin-containing high yield pulp and wet strength agent and melting of softening materials respectively, in order to further reinforce the stabilizing effect of the pattern structure of the paper.

[0041] The paper web may also be formed in at least three separate layers, at which the two outer layers each contains a certain amount of said material that softens, melts or hardens in the temperature interval 100-400°C, such as a lignin-containing high yield pulp, a wet strength agent, synthetic or natural polymers with thermoplastic properties, chemically modified lignin and/or synthetic or natural polymers in the presence of softening agents.

[0042] The invention is however not bound to the use of a special type of pulp, but may be applied with optional type of pulp or combinations of pulps.

[0043] Common additives such as wet strength agents, softening agents, fillers etc may of course also be used in the paper. The paper web can after impulse drying undergo different types of per se known treatments such as addition of different chemicals, further embossing, lamination etc. It is also possible when transferring the paper web between two different wires, e g from a dewatering wire to a drying wire, to have a speed difference between the wires so that the paper web is slowed down in connection with the transfer. The paper web will then be compacted to a certain extent, which further increases the softness qualities.

Claims

1. Method of producing a paper having a three dimensional pattern of alternating raised and recessed portions, which has been provided in connection with impulse drying, at which the wet paper web (10) is passed through at least one press nip (12) comprising a rotatable roll (13a) which is heated and that the paper web during the passage through the press nip is given a three dimensional pattern of alternating raised and recessed portions either by means of a patterned wire, band or belt and/or by a pattern on the heated roll (13a) and where said pattern is pressed into the paper web against a counter means (11,14),
characterized in
that the wet paper web (10) is passed through at least one further press nip (12b) comprising a rotatable heated roll (13b) and that the paper web also during the passage through said further press nip in connection with impulse drying is given a three dimensional pattern of alternating raised and recessed portions.

2. Method as claimed in claim 1,
characterized in
that the paper web (10) has a moisture content of at least 10% and preferably at least 20% by weight, before it enters said second press nip (12b).

3. Method as claimed in claim 2,
characterized in
that the paper web i s moistened before it enters the second press nip (12b).

4. Method as claimed in any of the preceding claims,

characterized in
that the second press nip (12b) is inverted with respect to the first press nip (12a), at which one side of the paper web (10) is heated to the highest temperature in the first press nip while the other side is heated to the highest temperature in the second press nip (12b).

5. Method as claimed in any of the preceding claims, **characterized in** **that** the three dimensional patterns given to the paper web in the two press nips are defferent.

6. Method as claimed in any of the preceding claims, **characterized in** **that** the counter means (11,14) is provided with a non-rigid surface so that the paper web is given a three dimensional structure having a total thickness greater than the thickness of the unpressed paper web.

7. Method as claimed in claim 6, **characterized in** **that** the paper web is supported by a compressible press filt (11) through the press nip (12), said press felt makes said non-rigid counter means.

8. Method as claimed in claim 7, **characterized in** **that** the press felt (11) is pressed against a resilient surface (14) in the press nip (12).

9. Method as claimed in any of the preceding claims, **characterized in** **that** the paper contains at least 10% by weight, preferably at least 30% by weight and more preferably at least 50% by weight, calculated on the dry fiber weight, of a lignin containing high yield pulp.

10. Method as claimed in any of the preceding claims, **characterized in**
adding to the paper web an amount of a material that softens, melts or hardens in the temperature interval 100-400°C or in some other way contributes in stabilizing the patterned structure that has been given the paper.

11. Method as claimed in claim 10, **characterized in** **that** said material comprises synthetic or natural polymers with thermoplastic properties, chemically modified lignin and/or synthetic or natural polymers together with softeners.

12. Method as claimed in claim 11, **characterized in** **that** said material comprises a wet strength agent.

13. Method as claimed in any of the preceding claims, **characterized in** **that** the paper web (10) has a varying material composition as seen in its thickness direction, and that it at least in the layer(s) intented to be located closest to the heated roll(s) (13) contains an amount of a material that softens, melts or hardens in the temperature interval 100-400°C or in some other way contributes in stabilizing the patterned structure that has been given the paper, such as a lignin containing high yield pulp, a wet strength agent, synthetic or natural polymers with thermoplastic properties, chemically modified lignin and/or synthetic or natural polymers together with softeners.

14. Method as claimed in any of the preceding claims, **characterized in** **that** it is used for producing absorbent soft paper.

Patentansprüche

1. Verfahren zur Herstellung eines Papiers mit einem dreidimensionalen Muster von alternierenden angehobenen und ausgenommenen Abschnitten, das in Verbindung mit Impulstrocknen vorgesehen wurde, wobei die nasse Papierbahn (10) durch wenigstens einen Pressspalt (12) mit einer drehbaren Walze (13a), die erwärmt ist, geführt wird, und dass der Papierbahn während des Durchgangs durch den Pressspalt ein dreidimensionales Muster von alternierenden angehobenen und ausgenommenen Abschnitten entweder mittels eines gemusterten Siebes, Bandes oder Gurtes und/oder durch ein Muster an der erwärmten Walze (13a) gegeben wird, und wobei das Muster in die Papierbahn gegen eine Gegeneinrichtung (11, 14) gepresst wird, **dadurch gekennzeichnet, dass**
die nasse Papierbahn (10) durch wenigstens einen weiteren Pressspalt (12b) mit einer drehbaren erwärmten Walze (13b) geführt wird, und dass der Papierbahn auch während des Durchgangs durch den weiteren Pressspalt in Verbindung mit Impulstrocknen ein dreidimensionales Muster aus alternierendem angehobenen und ausgenommenen Abschnitten gegeben wird.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die Papierbahn (10) einen Feuchtigkeitsanteil von wenigstens 10 Gew.-% und vorzugsweise wenigstens 20 Gew.-% aufweist, bevor sie in den zweiten Pressspalt (12b) eintritt.

3. Verfahren nach Anspruch 2, **dadurch gekennzeichnet, dass** die Papierbahn befeuchtet wird, bevor sie in den zweiten Pressspalt (12b) eintritt.

4. Verfahren nach einem der vorangehenden Ansprüche,
dadurch gekennzeichnet, dass
der zweite Pressspalt (12b) bzgl. des ersten Pressspaltes (12a) umgekehrt ist, wobei eine Seite der Papierbahn (10)auf die höchste Temperatur in dem ersten Presssapalt erwärmt wird, während die andere Seite auf die höchste Temperatur in dem zweiten Pressspalt (12b) erwärmt wird.

5. Verfahren nach einem der vorangehenden Ansprüche,
dadurch gekennzeichnet, dass
die dreidimensionalen Muster, die der Papierbahn in den beiden Pressspalten gegeben werden, unterschiedlich sind.

6. Verfahren nach einem der vorangehenden Ansprüche,
dadurch gekennzeichnet, dass
die Gegeneinrichtung (11, 14) mit einer nicht festen Oberfläche versehen ist, so dass der Papierbahn eine dreidimensionale Gestaltung mit einer Gesamtdicke gegeben wird, die größer ist als die Dicke der nicht gepressten Papierbahn.

7. Verfahren nach Anspruch 6,
dadurch gekennzeichnet, dass
die Papierbahn durch einen komprimierbaren Pressfilz (11) durch den Pressspalt (12) getragen wird, wobei der Pressfilz die nicht feste Gegeneinrichtung bildet.

8. Verfahren nach Anspruch 7,
dadurch gekennzeichnet, dass
der Pressfilz ?? (11) gegen eine nachgiebige Oberfläche (14) in dem Pressspalt (12) gepresst wird.

9. Verfahren nach einem der vorangehenden Ansprüche,
dadurch gekennzeichnet, dass
das Papier wenigstens 10 Gew.-%, vorzugsweise wenigstens 30 Gew.-% und insbesondere wenigstens 50 Gew.-%, berechnet anhand des trockenen Fasergewichtes, einer ligninenthaltenden Hochertragspulpe enthält.

10. Verfahren nach einem der vorangehenden Ansprüche,
gekennzeichnet durch
Hinzufügen zu der Papierbahn einer Menge von Material, das in dem Temperaturbereich 100 - 400°C aufweicht, schmilzt oder härtet, oder in irgendeiner anderen Art zur Stabilisierung der gemusterten Struktur beiträgt, die dem Papier gegeben wurde.

11. Verfahren nach Anspruch 10,
dadurch gekennzeichnet, dass
das Material synthetische oder natürliche Polymere mit thermoplastischen Eigenschaften, chemisch modifiziertes Lignin und/oder synthetische oder natürliche Polymere zusammen mit Aufweichmitteln enthält.

12. Verfahren nach Anspruch 11,
dadurch gekennzeichnet, dass
das Material ein Nassfestigkeitsmittel aufweist.

13. Verfahren nach einem der vorangehenden Ansprüche,
dadurch gekennzeichnet, dass
die Papierbahn (10) eine variierende Materialzusammensetzung gesehen in ihrer Dickenrichtung aufweist, und dass sie wenigstens in der Schicht/den Schichten, die dafür vorgesehen sind, am nächsten zu der erwärmten Walze/den erwärmten Walzen (13) angeordnet zu werden, eine Menge an Material enthält, das in dem Temperaturbereich 100 - 400°C aufweicht, schmilzt oder härtet, oder auf irgendeine andere Art und Weise zur Stabilisierung der gemusterten Struktur beiträgt, die dem Papier gegeben wurde, wie z.B. eine ligninenthaltende Hochertragspulpe, ein Nassfestigkeitsmittel, synthetische oder natürliche Polymere mit thermoplastischen Eigenschaften, chemisch modifiziertes Lignin und/oder synthetische oder natürliche Polymere mit Aufweichmitteln.

14. Verfahren nach einem der vorangehenden Ansprüche,
dadurch gekennzeichnet, dass
es für die Herstellung von absorbierendem weichem Papier verwendet wird.

Revendications

1. Procédé de fabrication d'un papier doté d'un motif tridimensionnel constitué de parties en relief et de parties en creux qui alternent, lequel papier a été réalisé en liaison avec le séchage par impulsions dans lequel on fait passer la bande de papier humide (10) dans au moins une emprise (12) de pressage comprenant un rouleau rotatif (13a) qui est chauffé, et dans lequel la bande de papier, pendant son passage dans l'emprise de pressage, reçoit un motif tridimensionnel constitué de parties en relief et de parties en creux qui alternent, au moyen d'une toile métallique, d'une bande ou d'une courroie comportant un motif et/ou au moyen d'un motif situé sur le rouleau chauffé (13a) et ledit motif étant imprimé dans la bande de papier à l'encontre d'un moyen antagoniste (11, 14);
caractérisé en ce que
l'on fait passer la bande de papier humide (10)

dans au moins une autre emprise de pressage (12b), comprenant un rouleau rotatif chauffé (13b) et **en ce qu**'également pendant le passage dans ladite autre emprise de pressage, la bande de papier reçoit, en liaison avec le séchage par impulsions, un motif tridimensionnel constitué de parties en relief et de parties en creux.

2. Procédé selon la revendication 1,
caractérisé en ce que
la bande de papier (10) a une teneur en humidité d'au moins 10 % en poids et de préférence d'au moins 20 % en poids, avant de pénétrer dans ladite seconde emprise de pressage (12b).

3. Procédé selon la revendication 2,
caractérisé en ce que
la bande de papier est humidifiée avant de pénétrer dans la seconde emprise de pressage (12b).

4. Procédé selon l'une quelconque des revendications qui précèdent,
caractérisé en ce que
la seconde emprise de pressage (12b) est inversée par rapport à la première emprise de pressage (12a), où une face de la bande de papier (10) est chauffée jusqu'à atteindre la température la plus élevée dans la première emprise de pressage tandis que l'autre face est chauffée jusqu'à atteindre la température la plus élevée dans la seconde emprise de pressage (12b).

5. Procédé selon l'une quelconque des revendications qui précèdent,
caractérisé en ce que
les dessins tridimensionnels conférés à la bande de papier dans les deux emprises de pressage sont différents.

6. Procédé selon l'une quelconque des revendications qui précèdent,
caractérisé en ce que
le moyen antagoniste (11, 14) comporte une surface non rigide, de telle sorte que la bande de papier reçoit une structure tridimensionnelle dont l'épaisseur est supérieure à l'épaisseur de la bande de papier n'ayant pas reçu l'impression.

7. Procédé selon la revendication 6,
caractérisé en ce que
la bande de papier est supportée par un feutre de pressage (11) dans son passage dans l'emprise de pressage (12), ledit feutre de pressage constituant ledit moyen antagoniste non rigide.

8. Procédé selon la revendication 7,
caractérisé en ce que
le feutre de pressage (11) est pressé contre une surface élastique (14) dans l'emprise de pressage (12).

9. Procédé selon l'une quelconque des revendications qui précèdent,
caractérisé en ce que
le papier contient au moins 10 % en poids, de préférence au moins 30 % en poids et plus préférablement au moins 50 % en poids, pourcentage calculé sur le poids de fibres sèches d'une pâte à grand rendement contenant de la lignine.

10. Procédé selon l'une quelconque des revendications qui précèdent,
caractérisé par
l'addition à la bande de papier d'une certaine quantité d'un matériau qui ramollit, fond ou durcit dans la plage de températures allant de 100°C à 400°C, ou qui contribue d'une quelconque autre manière à stabiliser la structure comportant des motifs qui a été conférée au papier.

11. Procédé selon la revendication 10,
caractérisé en ce que
ledit matériau comprend des polymères synthétiques ou naturels dotés de propriétés thermoplastiques, des lignines modifiées chimiquement et/ou des polymères synthétiques ou naturels combinés à des agents adoucissants.

12. Procédé selon la revendication 11,
caractérisé en ce que
ledit matériau comprend un agent de résistance à l'état mouillé.

13. Procédé selon l'une quelconque des revendications qui précèdent,
caractérisé en ce que
la bande de papier (10) a une composition de matériau qui varie, vu dans le sens de l'épaisseur, et **en ce qu**'au moins dans la(les) couche(s) destinée(s) à être située(s) le plus près des rouleaux chauffés (13) elle contient une certaine quantité d'un matériau qui ramollit, fond ou durcit dans la plage de températures allant de 100°C à 400°C, ou qui contribue, d'une quelconque autre manière, à stabiliser la structure comportant des motifs qui a été conférée au papier, tel qu'une pâte à haut rendement à l'état humide, des polymères synthétiques ou naturels dotés de propriétés thermoplastiques, des lignines modifiées chimiquement et/ou des polymères synthétiques ou naturels combinés à des agents adoucissants.

14. Procédé selon l'une quelconque des revendications qui précèdent,
caractérisé en ce que
il est utilisé pour fabriquer du papier absor-

bant doux.

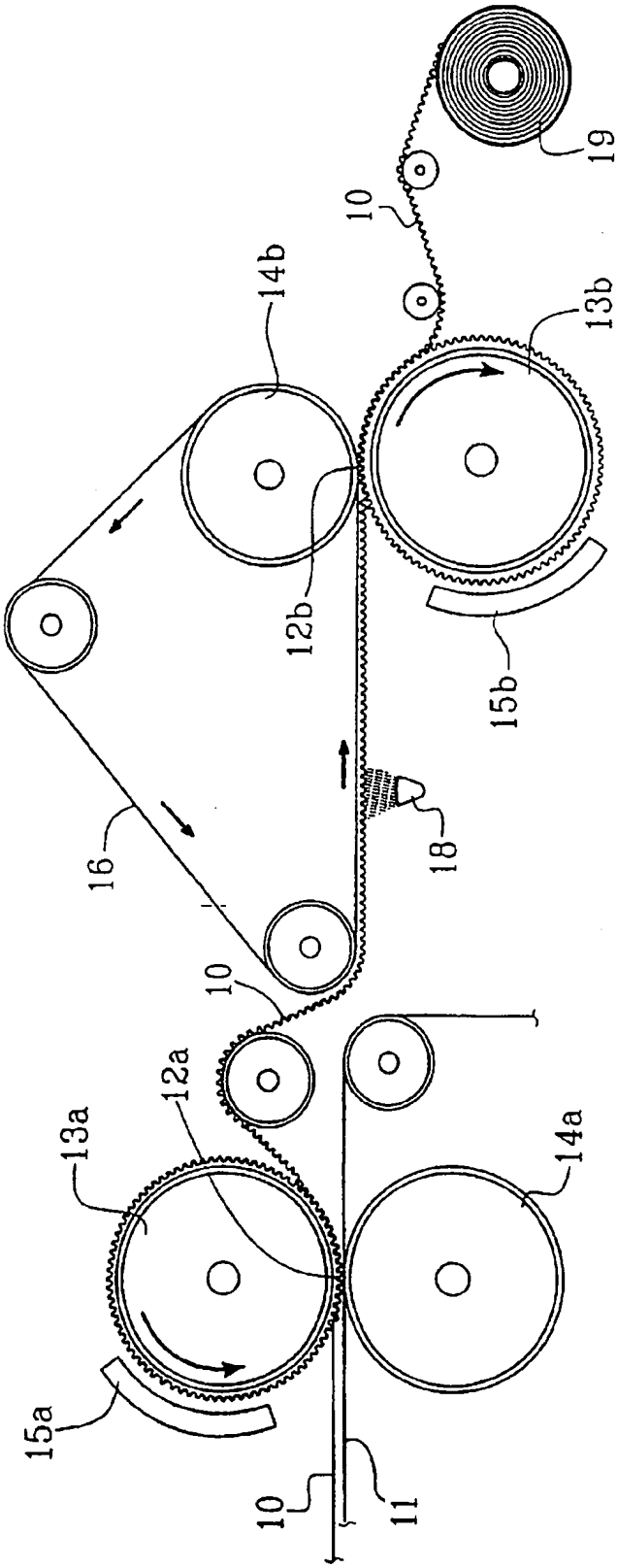

FIG.1

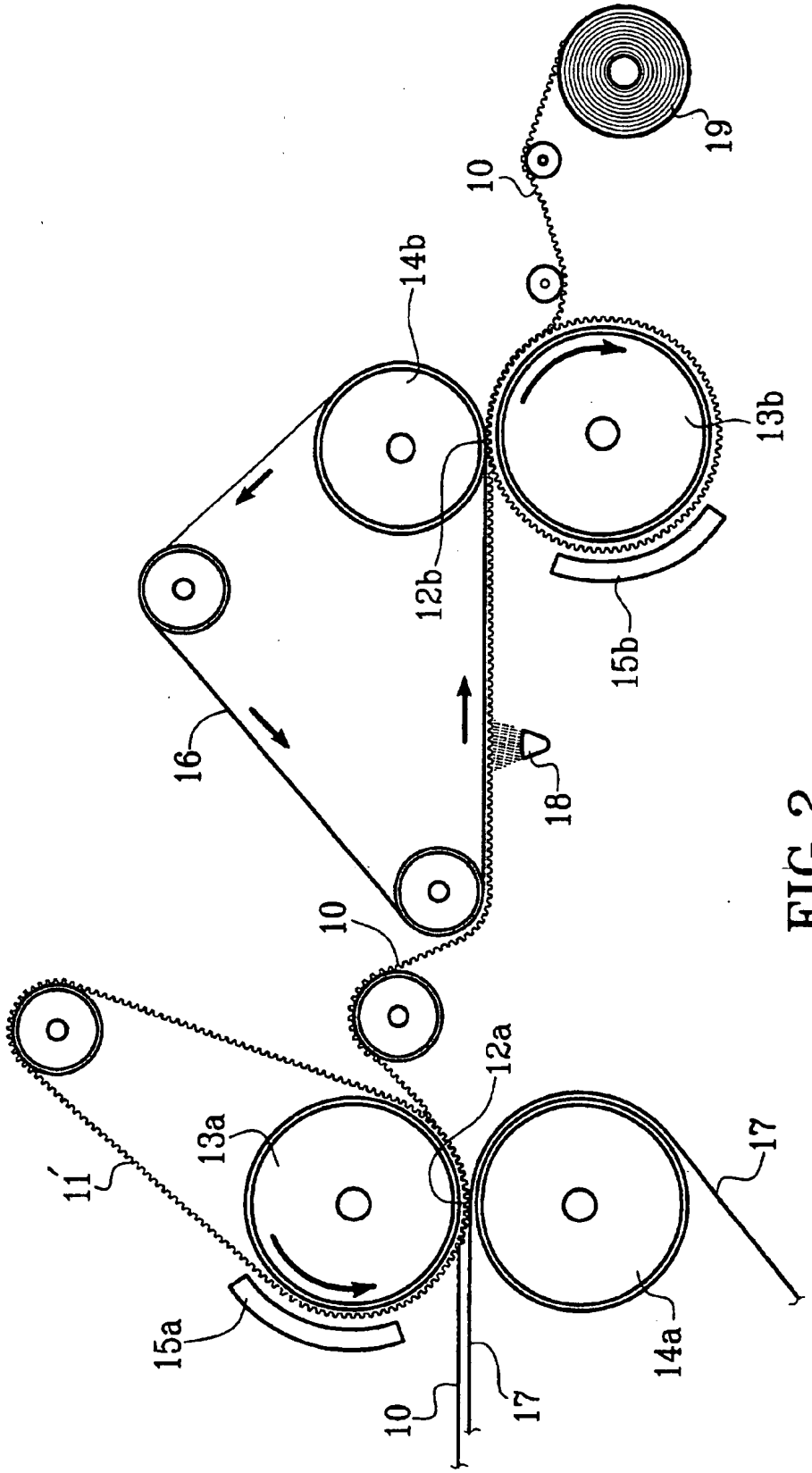

FIG.2

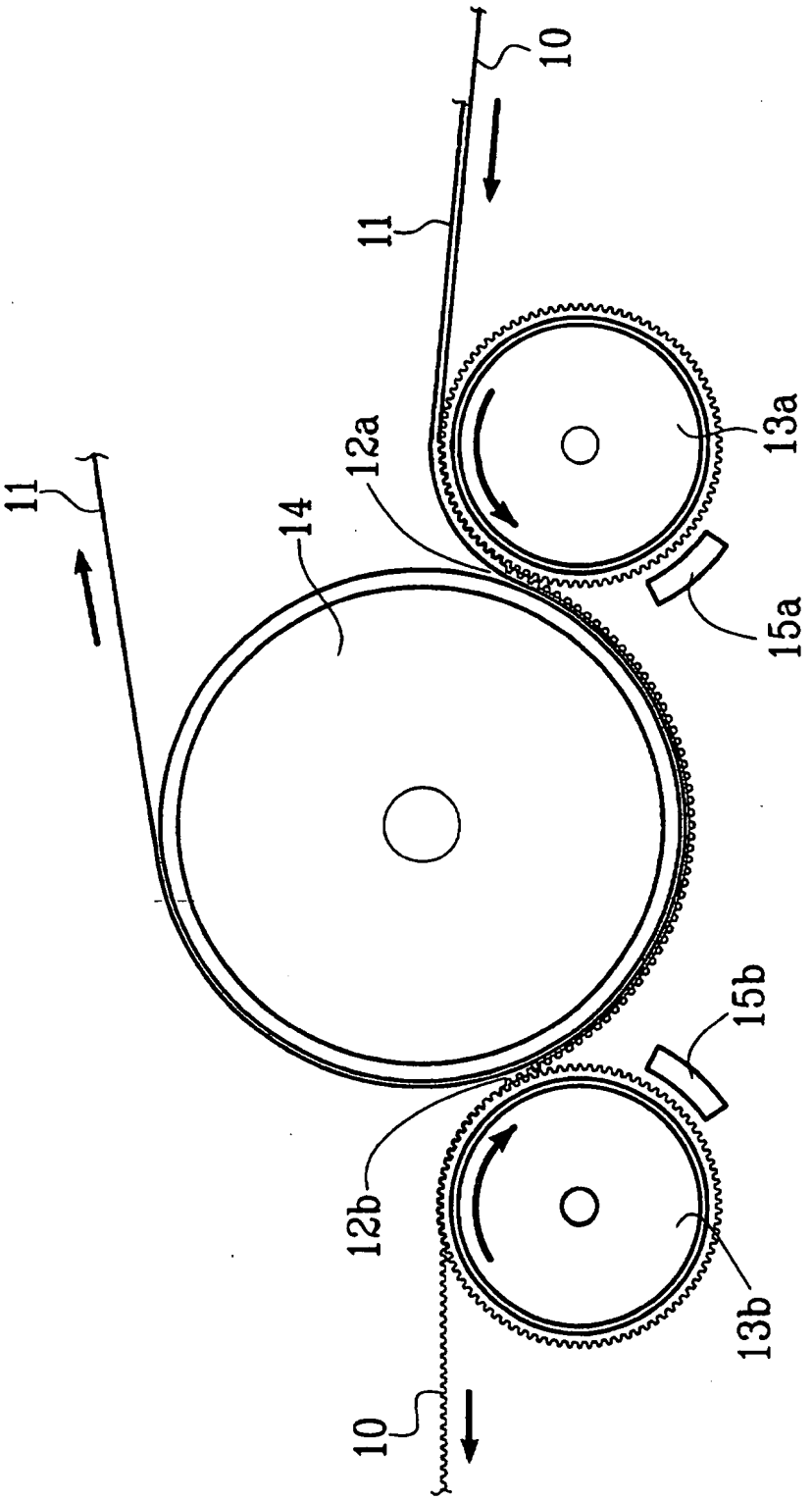

FIG.3